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EP 0230808 A1 EP 0213993 A1 US 4723454 A

(58) Field of search
UK CL (Edition J) **E2A AMX**
INT CL[4] **E05B, E05C**

(54) **Power actuated unit for vehicle central locking system**

(57) The unit for a central vehicle door locking system has a lock actuating formation 20 which is shifted between locked and unlocked positions by a motor driven operating member 16, the latter holding the actuating formation 20 in a locked position at a first position Figure 1C, and allowing free movement of the formation between locked and unlocked positions at a second position Figure 1B to which it is resiliently urged. A motor driven dead-locking dog 28 is movable between an engaged position at which it coacts with a window 26 of the operating member with the latter at its first position for dead-locking. As shown, formation 20 is a lever having a pin 22 coacting with a snail formation 18 of the operating member 16 which is in the form of a cam, and the operating member 16 at a third position drives the formation 20 into an unlocked position (Figure 1A).

The dog 28 projects from shaft 30 of a motor 32 mounted on a housing part 10*b*, operation of motor 32 being phased with respect to operation of main actuating motor 12, rotation of shaft 30 being against the force of a spring. The dog 28 is held in its engaged position by step (36*a*, Figures 3A, 3B, 3C) of window 26 after motor 32 is turned off, the dog 28 being 'kicked' upwards to its disengaged position.

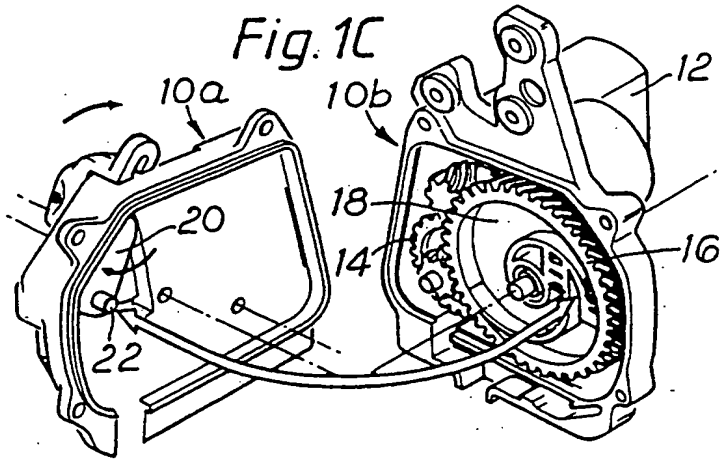

Fig. 1C

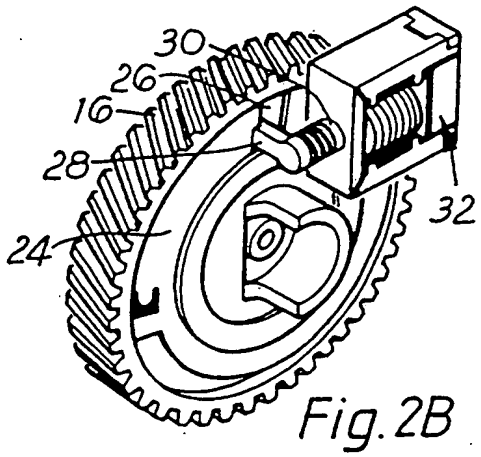

Fig. 2B

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Fig. 1A

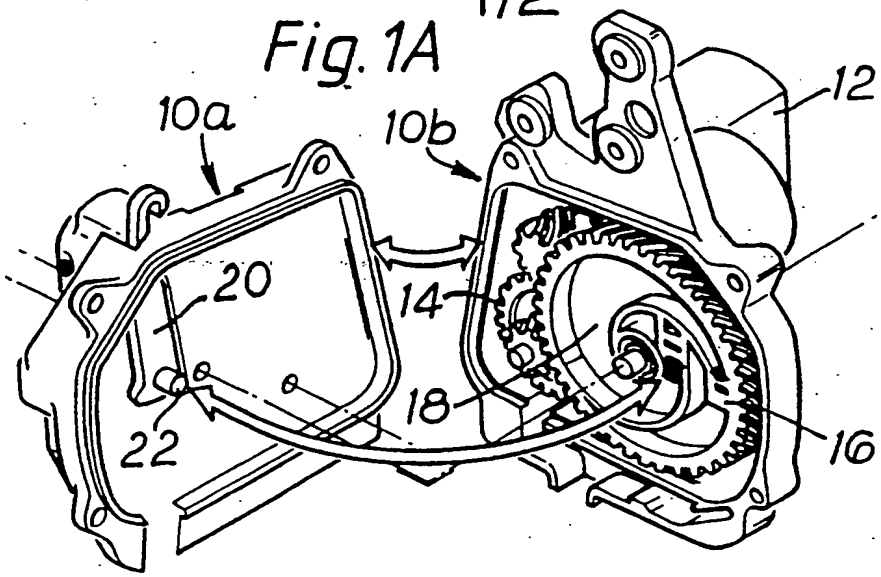


Fig. 1B

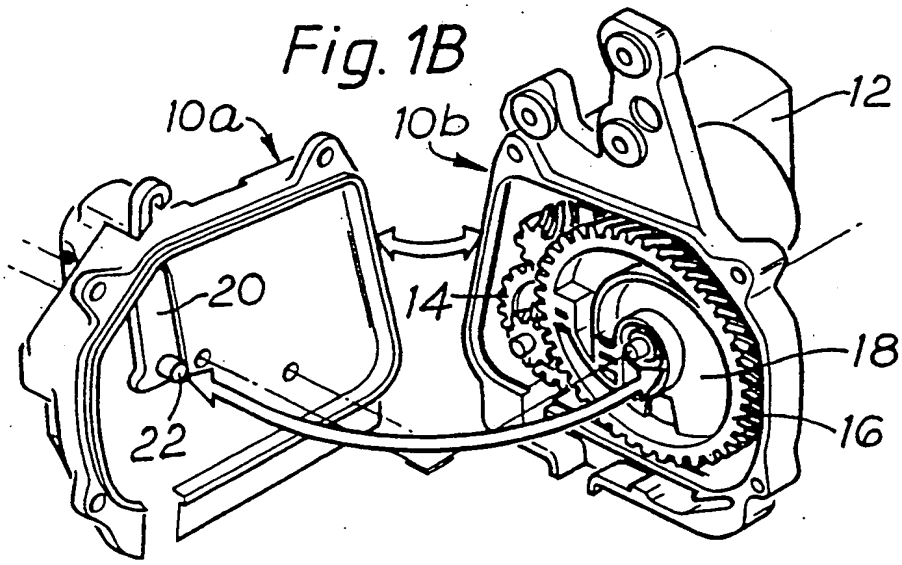
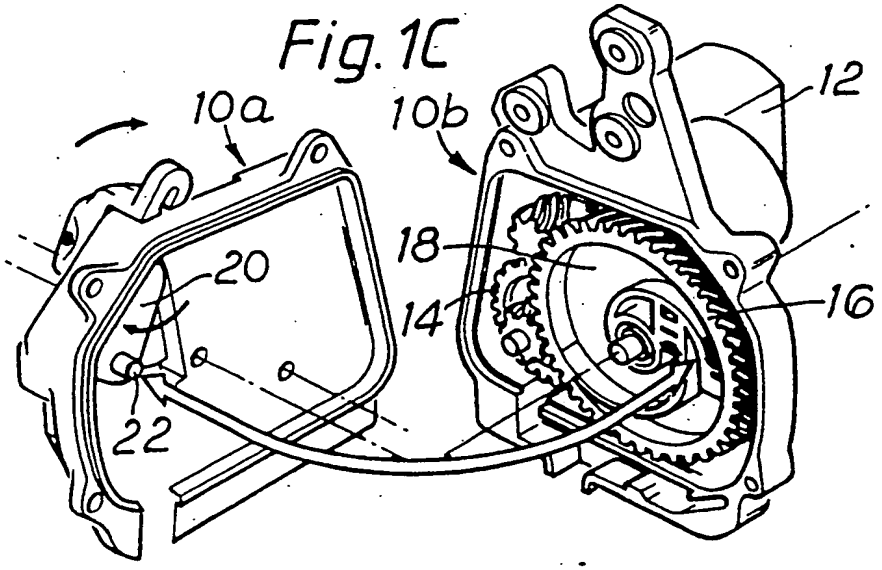


Fig. 1C



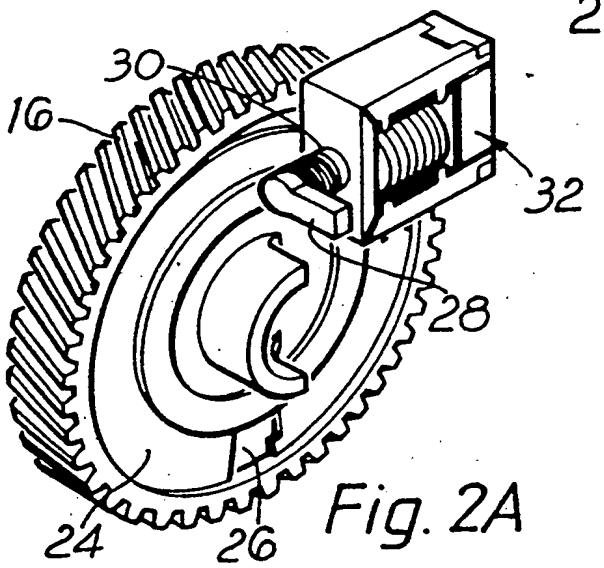


Fig. 2A

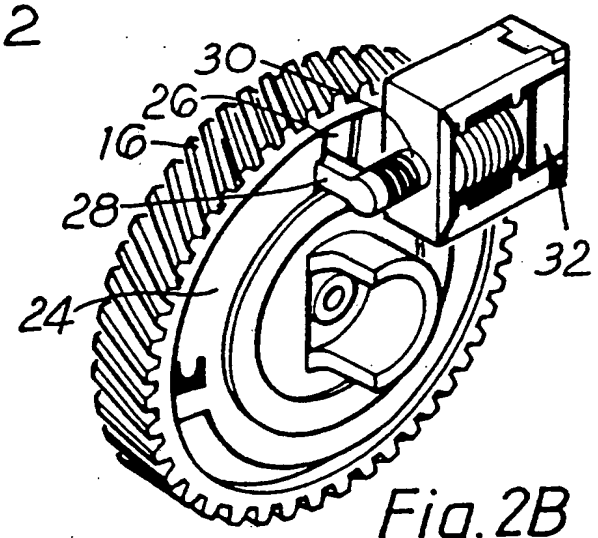


Fig. 2B

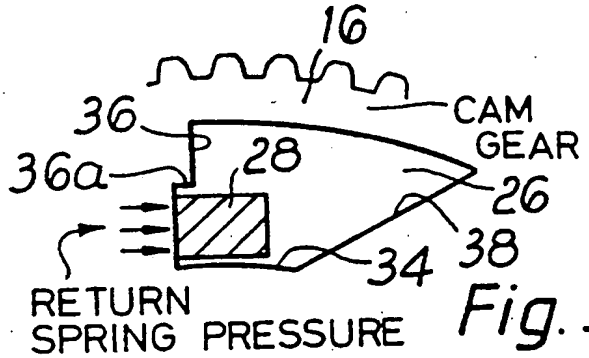


Fig. 3A

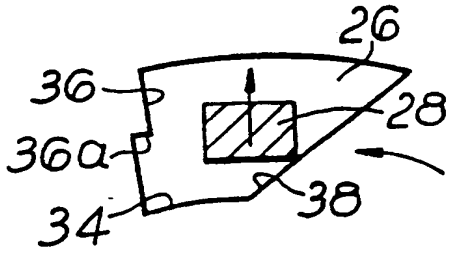


Fig. 3B

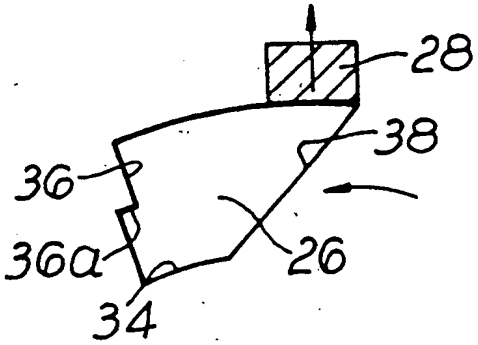


Fig. 3C

VEHICLE DOOR LOCKING SYSTEM

This invention relates to locking systems for vehicle doors of the kind in which a central control unit is connected to the individual locks for electrical actuation of the latter whereby locking or unlocking of all the doors can be effected from a single control station actuated from within or outside the vehicle, hereinafter referred to as "central locking systems" and more specifically to the provision in said system of a dead-locking or super-locking facility by which the lock mechanism is selectively positively retained at the secure position so that it cannot be freed by use of any of the manual actuating means within or outside the vehicle.

Such provision is increasingly desirable for improving the security of unattended vehicles so that a lock cannot readily be released by forcing a window or using a probe, hook or other tool to gain access to the interior door handles, sill release buttons or the like.

One example of a central locking system to which the invention is conveniently applicable is described in our GB Patent 2176528.

The object of the invention is to provide a central locking system with a remotely controllable dead-locking facility which is economical to produce, compact so that it can be accommodated in known patterns of lock actuator units without increasing their bulk and/or without substantial redesign thereof, yet which is positive and reliable in use and of simple and durable construction.

According to the invention there is provided a power actuated unit for a central locking system including a lock actuating formation shiftable between locked and unlocked positions; a motor driven operating member formed to coact with the actuating formation for selective movement thereof in response to operation of a central control unit of the system in use, said member

being shaped to prevent displacement of the actuating formation from the locked position at a first position of the member whereby the lock is held in a dead-locked condition but permit unrestricted movement of the lock actuating formation between locked and unlocked positions at a second position of said member remote from the first position; and resilient means urging the operating member to the second position; characterised in that said unit further includes a motor driven dead-locking catch shiftable between an engaged position positively retaining the operating member at the first position to dead-lock the unit in use, and a disengaged position at which the said member is free to move to or from the first position.

Conveniently the operating member is further moveable to a third position remote from the second position and on the opposite side thereof to the first position to effect positive displacement of the actuating formation to the unlocked position, and the resilient means may further urge the operating member to the second position from both of the third and first positions.

The operating member may be in the form of a rotary cam having a snail or other camming formation coacting with the actuating formation e.g. as described in our said GB patent 2176528.

Preferably the dead-locking catch is a dog projecting radially of a rotatably driven shaft, the envelope of revolution of the dog intersecting the path of movement of the operating member to engage a cutout or notch therein when said member is at the first position.

The dog or other dead-locking catch may be resiliently urged towards its disengaged position and a coacting face of the operating member may be shaped to latch the dog or other dead-locking catch at its engaged position under resilient loading of the operating member so that it is only released on powered shifting of the operating member to disengage said face therefrom.

Conveniently, with the latter arrangement, there is also an angled or other camming face on the operating member which urges or assists the dog or other dead-locking catch to its disengaged position on said powered shifting of the operating member.

An embodiment of the invention is now more particularly described with reference to the accompanying drawings wherein

Figures 1A,B and C are exploded perspective views of a power actuated locking unit showing different stages of its operation;

Figures 2A and B are perspective views of a cam type operating member of said unit and associated dead-locking catch in different positions of operation; and

Figures 3A,B and C are detail diagrammatic views of the coaction between said catch and a formation of the operating member.

Referring firstly to Figure 1 the unit shown is generally of the type described in our said GB patent 2176528 to which reference is made for further detail of its construction and operation and of a vehicle central locking system utilising a plurality of said units in conjunction with a central remote control station of the vehicle.

The unit includes a body or housing 10 formed in two parts 10a,10b shown separated in Figure 1. Part 10b mounts an actuating motor 12 and encloses a gear train 14 drivingly connecting said motor to an operating member in the form of a rotary cam 16 a front face of which is formed to provide a snail formation 18 in the form of a spiral profile hollow.

A lock actuating formation in the form of a lever 20 pivoted in body portion 10a is provided with a pin 22 which coacts with snail formation 24. On assembly the end of lever 20 remote from pin 22 which extends outside housing 10 will be linked to the lock mechanism of the associated door (not shown). Rotation of cam 16 in this example shifts lever 20 angularly to locked and unlocked

positions for corresponding mechanical operation of the locking mechanism. Snail formation 18 is so profiled that at a first and extreme position of rotation pin 22 is trapped in a narrow radially outer end of formation 18 to drive lever 22 to its locked position as shown in Figure 1C; at the middle of the range of rotation the cam is at a second position with pin 20 coacting with the radially wide portion of the snail formation 18 so that it is free to be manually shifted between locked and unlocked positions independently of operation of motor 12 e.g. by a sill button of the associated door, said position being shown in Figure 1B; and at the other extreme of rotation with cam 16 at a third position pin 22 is driven positively into the narrow and radially inner end of said formation to drive it to the unlocked position as shown in Figure 1A.

Cam 16 is resiliently urged to the second (i.e. mid) position by a torsion return spring (not shown) within housing part 10b.

Figure 2 shows a dead-locking catch arrangement of the unit. The rear face of rotary cam 16 (not visible in Figure 1) is provided with a cutout or window 26 immediately adjacent to the toothed periphery of the cam.

A dead-locking catch in the form of a dog 28 coacts with window 26 in a manner to be described in greater detail below to positively secure cam 16 selectively at the said first position so that the unit, and hence the associated latch mechanism, is dead-locked.

The acting part of dog 28 is of rectangular cross-section and projects radially from a shaft 30 of a small rotary dead-locking motor 32 mounted in housing part 10b behind the rim of cam 16, the axis of shaft 30 lying parallel to the plane of the cam rearface 24.

When motor 32 is powered it rotates shaft 30 and dog 28 through 180° from a disengaged position shown in Figure 2A to an engaged position shown in Figure 2B in which the acting distal end part of dog 28 enters the

window 26.

Shaft 30 is provided with a return spring resiliently urging dog 28 to the Figure 2A disengaged position.

Operation of motor 32 is phased with respect to operation of the main actuating motor 12 in use so that, when a dead-locking command is passed to the unit (and to other like equipped units on other doors of the vehicle) motor 12 will first operate to power the cam 16 to the first, i.e. dead-locked position (Figure 1C) which will position window 26 to receive dog 28 i.e. rotating cam 16 anti-clockwise as viewed in Figure 2. While power is still applied by motor 12, so holding cam 16 against the force of its return spring motor 32 is also operated to power dog 28 for rotation anti-clockwise as viewed in Figure 2 from the disengaged position of Figure 2A to the engaged position of Figure 2B where the acting part of dog 28 is engaged in window 26, said rotation being against the force of the return spring on shaft 30. While power is maintained on motor 32 to urge the acting part of the dog against the lower i.e. radially inner edge 34 of window 28, power to actuating motor 12 is turned off and the action of the main return spring acting on cam 16 urges a trailing side edge 36 (i.e trailing in the direction of unlocking rotation of cam 16) into abutment with a side face of dog 28 as shown in Figure 3A. Edge 36 is notched to provide a downwardly directed, i.e. radially inwardly directed step 36a serving as a latch holding dog 28 against rotation from its engaged position under the action of its return spring. Power to motor 32 is now turned off and the mechanism of the unit and associated latch is mechanically positively held against movement from locked condition so preventing any actuation by the manual mechanism (e.g. door handles, sill buttons etc) of the associated door.

When the dead-locking condition is to be terminated an appropriate command to the central control unit will power motor 12 briefly in the locking direction i.e.

again urging cam 16 anti-clockwise as viewed in Figure 2. This movement frees dog 28 from the notched trailing side edge 36 of window 26 and causes its opposite side corner to be acted on by the leading side edge 38 of window 26. This latter edge is formed at an angle as shown in Figure 3 so that it slopes radially outwardly in the leading direction.

This sloping edge coacts with the corner of dog 28 as shown in Figure 3b to "kick" it upwards (as viewed in the drawings) towards its disengaged position ensuring positive unlocking action coupled with the force exerted by the associated return spring on shaft 30, thus it swings clear of window 26 as in Figure 3C to spring back to its disengaged position without any power having to be applied to the associated dead-locking motor 32. At the same time power to main motor 12 can be ceased, leaving the return spring of the cam 16 to restore it to the mid position of Figure 1B leaving the mechanism free for operation by the manual actuating means (sill button etc) or, if positive unlocking is required by way of the central control unit, the appropriate command will operate motor 12 in the reverse direction to urge the cam to the unlocked position of Figure 1A.

Operation in this manner simplifies the electrical connections required to the power actuated unit, three wires only are necessary, a common connection and an individual wire to each motor 12 and 32, electrical actuation and control being effected through appropriate control box switching contacts and motor protection being provided by thermistor devices or the like in known manner. Thus the motors may have protection by individual positive temperature coefficient temperature thermistors or use of a single common positive temperature coefficient thermistor for both motors is also contemplated.

It will be seen that the dead-locking catch unit consisting of motor 32, shaft 30, and dog 28 is extremely compact and simple to control and operate, thus its inclusion in existing designs of actuator unit is often

possible without difficulty, without increase in the overall bulk and dimensions of the unit, and with minimum adaptation or redesign of the existing unit components, the only adaptation thereto being the shaping of the cam or other operating member to provide the coacting window or other formation for engagement by the dog or other dead-locking catch. As referred to above only one extra wire is needed together with one extra switching control so that this positive and reliable dead-locking feature can be incorporated in central locking systems of most designs of vehicle with little extra cost or difficulty.

CLAIMS

1. A power actuated unit for a central locking system including a lock actuating formation shiftable between locked and unlocked positions; a motor driven operating member formed to coact with the actuating formation for selective movement thereof in response to operation of a central control unit of the system in use, said member being shaped to prevent displacement of the actuating formation from the locked position at a first position of the member whereby the lock is held in a dead-locked condition but permit unrestricted movement of the lock actuating formation between locked and unlocked positions at a second position of said member remote from the first position; and resilient means urging the operating member to the second position; characterised in that said unit further includes a motor driven dead-locking catch shiftable between an engaged position positively retaining the operating member at the first position to dead-lock the unit in use, and a disengaged position at which the said member is free to move to or from the first position.

2. A unit as in Claim 1 characterised in that the operating member is further movable to a third position remote from the second position and on the opposite side thereof to the first position to effect positive displacement of the actuating formation to the unlocked position.

3. A unit as in Claim 2 characterised in that the resilient means urges the operating member to the second position from both the third and the first positions.

4. A unit as in Claim 1, 2 or 3 characterised in that the operating member is a rotary cam having a camming formation coacting with the actuating formation.

5. A unit as in any preceding claim characterised in that the dead-locking catch is a dog projecting radially of a rotatably driven shaft, the envelope of revolution of the dog intersecting the path of movement of the

operating member to engage a formation of the latter when said member is at the first position.

6. A unit as in any preceding claim characterised in that the dead-locking catch is resiliently urged towards its disengaged position.

7. A unit as in Claim 6 characterised in that a formation of the operating member with which the dead-locking catch engages at its engaged position is shaped to latch said catch at the latter position under resilient loading of the operating member whereby the catch is only released on powered shifting of the operating member.

8. A unit as in Claim 7 characterised in that the operating member includes an element which coacts with the dead-locking catch on said powered shifting of the operating member to urge or assist displacement of the catch to its disengaged position.

9. A power actuated unit for a central locking system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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